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Now $\pi.RA^2$ is the area of the base of a circumscribing cylinder the axis of which coincides with, and whose length is equal to, RD, which call C.

The factor $\pi.Eo^2$ in (10) represents the area of a circle, radius Eo and center on the line AL, and when multiplied by VU, and summed for all positions of the triangle RCB it represents the volume generated by the revolution of the area $AEDL$ about AL as an axis, which volume call S'.

Substituting in (10) we have $P' = \frac{2}{3}C - \frac{2}{3}S'$. (11)

Prolong IB to b. The revolution of $HIab$ about LA generates the vol. $\pi.2FA.HI.EF$ (12); while the rev. of $VUKm$ produces $\pi.FA^2.VU$. (13)

Since $EF.HI = 2FA.VU$ (see ANALYST, Vol. IX, p. 107); therefore by substitution (12) becomes $2\pi.FA.2FA.VU = 4\pi.FA^2.VU$. (14)

Comparing (13) and (14) (as $Eo = FA$) we see that the volume denoted by (12) = four times the volume denoted by (13); and as this relation is constant it follows that the volume generated by the revolution of the area $AEDR$ about $DL = 4S'$; therefore the circumscribing cylinder $C = 5S'$, and consequently $S' = \frac{1}{5}C$. Substituting this value of S' in (11) we have

$$P' = \tfrac{2}{3}C - \tfrac{2}{15}C = \tfrac{8}{15}C.$$

[If x and y represent the coordinates of the point R on the axis of the parabola, then is $\frac{3}{5}x$ the distance of its center of gravity from the vertex, A; and by the theorem of Guldinus we have $\frac{2}{3}xy \times \frac{4}{5}\pi x = \frac{8}{15}\pi x^2 y$ = the vol. generated by the revolution of the parabola about its limiting ordinate, y, $= \frac{8}{15}$ of the volume of a cylinder whose radius is x and altitude y. This agrees with the above result so ingeneously deduced by Mr. Mathiot.—Ed.]

NOTE BY HENRY HEATON.—To integrate $\dfrac{dx}{(a+b\tan x)^n}$, differentiate $\dfrac{1}{(a+b\tan x)^{n-1}}$ and we get

$$-\frac{(n-1)b\sec^2 x dx}{(a+b\tan x)^n} = -\frac{(n-1)(a^2+b^2)dx}{b(a+b)\tan x)^n} + \frac{2a(n-1)dx}{b(a+b\tan x)^{n-1}} - \frac{(n-1)dx}{b(a+b\tan x)^{n-2}}.$$

Hence

$$\int\frac{dx}{(a+b\tan x)^n} = \frac{-b}{(n-1)(a^2+b^2)(a+b\tan x)^{n-1}} + \frac{2a}{a^2+b^2}\int\frac{dx}{(a+b\tan x)^{n-1}} - \frac{1}{a^2+b^2}\int\frac{dx}{(a+b\tan x)^{n-2}}$$

In like manner, differentiating $\dfrac{\tan x}{(a+b\sec x)^{n-1}}$, we get

$$\int\frac{dx}{(a+b\sec x)^n} = \frac{-b^2\tan x}{a(n-1)(a^2-b^2)(a+b\sec x)^{n-1}} + \frac{(3n-2)a^2-(n-1)b^2}{a(n-1)(a^2-b^2)}\int\frac{dx}{(a+b\sec x)^{n-1}}$$
$$-\frac{3n-1}{(n-1)(a^2-b^2)}\int\frac{dx}{(a+b\sec x)^{n-2}} + \frac{n}{a(n-1)(a^2-b^2)}\int\frac{dx}{(a+b\sec x)^{n-3}}.$$